WHAT IS CLAIMED IS:

1. A multi-aperture high-fill-factor telescope comprising:

a plurality of sub-aperture telescopes, each sub-aperture telescope being configured to collect electromagnetic radiation from a scene and including first, second, third, and fourth powered mirrors;

a set of combiner optics configured to combine electromagnetic radiation collected by the sub-aperture telescopes to form an image of the scene; and

a plurality of sets of relay optics, the sets of relay optics are respectively associated with the sub-aperture telescopes and each set of relay optics includes a first flat fold mirror, a trombone mirror pair, and a last flat fold mirror, wherein the last flat fold mirrors are disposed within about a beam diameter of respective exit pupils of the sub-aperture telescopes.

2. The multi-aperture high-fill-factor telescope of claim 1, wherein the last flat fold mirrors are disposed substantially symmetrically about a central axis.

3. The multi-aperture high-fill-factor telescope of claim 1, wherein each of the first and second powered mirrors of the sub-aperture telescopes form a first Cassegrain telescope and each third and fourth powered mirrors of the sub-aperture telescopes form a second Cassegrain telescope.

4. The multi-aperture high-fill-factor telescope of claim 1, wherein each of the first and second powered mirrors of the sub-aperture telescopes forms a Gregorian telescope and each third and fourth powered mirrors of the sub-aperture telescopes form a Cassegrain telescope.

5. The multi-aperture high-fill-factor telescope of claim 1, wherein each of the first and second powered mirrors of the sub-aperture telescopes form a Cassegrain telescope and each third and fourth powered mirrors of the sub-aperture telescopes form a Gregorian telescope.

6. The multi-aperture high-fill-factor telescope of claim 1, wherein the set of combiner optics form a combiner telescope.

7. The multi-aperture high-fill-factor telescope of claim 6, wherein the exit pupils are located about at an entrance pupil of the combiner telescope.

8. The multi-aperture high-fill-factor telescope of claim 1, wherein the exit pupils are located about at the last flat fold mirrors.

9. The multi-aperture high-fill-factor telescope of claim 1, wherein the first, second, third, and fourth powered mirrors of each telescope are configured to correct for sine magnification errors.

10. A multi-aperture high-fill-factor telescope comprising:

a plurality of sub-aperture telescopes, each sub-aperture telescope including at least first, second, third, and fourth powered mirrors and an exit pupil disposed optically remote from an associated sub-aperture telescope;

a plurality of sets of relay optics disposed optically downstream from the plurality of sub-aperture telescopes and each set of relay optics includes a first flat fold mirror, a trombone mirror pair, and a last flat fold mirror, wherein each last flat fold mirror is disposed within about a beam diameter of an associated exit pupil; and

a combiner telescope disposed optically downstream from the sets of relay optics.